Journal of Superconductivity and Novel Magnetism 2013 vol.26 N9, pages 2843-2844

Crossover from localized spins to weak coupling charge carriers: Theory for nuclear spin-lattice relaxation in copper oxide HTSC

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Abstract

The dynamic spin susceptibility χ+,- total(ω ,q) that takes into account the interplay of localized and itinerant charge carriers exhibits a diffusive-like, extremely narrow and sharp symmetric ring of maxima at very small wave vectors: |q|=q0 where q0∝ ω/J≈10-6 with the Nuclear Magnetic Resonance (NMR) frequency ω and the superexchange coupling constant J together with the peak at the antiferromagnetic wave vector Q=(π,π). The calculated plane copper 63(1/T1) and oxygen 17(1/T1) nuclear spin-lattice relaxation rates from carrier-free right up to optimally doped La2-x Srx CuO4 are in good agreement with experimental data. © 2013 Springer Science+Business Media New York.

http://dx.doi.org/10.1007/s10948-013-2214-4

Keywords

Copper oxide HTSC, NMR/NQR